INSIDE: THE VIOLENT WORLD OF RAPTORS

Montana Outdoors

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JULY-AUGUST 2012

CRYSTAL CLEAR

FWP explains the logic behind its fisheries management decisions

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WESTSLOPE CUTTHROAT CATCH A BREAK

MARSHALING FORCES FOR A NEW WILDLIFE AREA

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Montana Outdoors

JULY-AUGUST 2012

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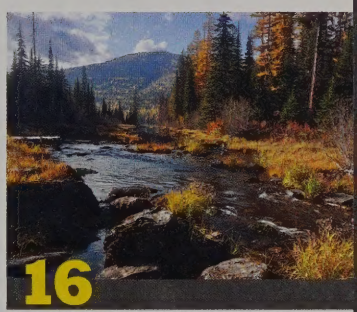

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READY FOR ITS CLOSEUP The common green darner dragonfly is just one of the many beautiful arthropods living in Montana. See more of these often ignored beauties on page 22. Photo by Bob Martinka.

FRONT COVER Trout tail splash in a Centennial Valley stream. Photo by Kenton Rowe.

Still trying to decide

I wanted to congratulate you on the remarkable March-April 2012 issue of your consistently great publication. Each and every article was captivating. Years ago I was introduced to the Canadian upper Kootenai drainages and bull trout spawning habitat that was nearly as wild as when early explorers first saw it. This area lies just west of the newly protected area described in your article "How a Great Place Was Saved." I am constantly torn between visiting Montana, British Columbia, and Alaska, and intend on spending the rest of my life researching and formulating an opinion on the best place to go.

Lloyd L. Wilson III, DVM
Centerville, KS

The value of a wild cutthroat

When I was a boy, I dreamed about fishing in the Treasure State. Since 1988 I have traveled to Montana every few years for a fishing trip. Each one has been a fulfillment of those childhood dreams. The last thing that concerns me is the cost of a nonresident license. I believe that every dollar I spend in Montana, whether for license fees, lodging, or cold beer, is well worth the cost. There is no place on Earth like your state. For those who complain about the fees, I ask: How do you put a price tag on a fly-caught wild cutthroat in your hand, or a dinner with family and friends of a harvested elk, deer, or pronghorn? The very people in my home state of New York who complain about our increased resident hunting and fishing license fees are the same ones who think nothing of dropping hundreds of dollars on tickets and refreshments at a sporting event. People need to get their priorities straight. If it's not worth the extra cost, then, as one of your letter writers suggested, we will not miss you.

> "The last thing that concerns me is the cost of a nonresident license."

Howard Kligerman
Fayetteville, NY

Important income

I very much enjoy the excellent photos and articles in *Montana Outdoors* magazine. In the recent March-April issue, in the letters section under the heading "Hunting here: priceless," a Montana resident rails against a hunter from Washington who dares to complain about the increased nonresident hunting fees. He ends by saying: "I am sorry that you feel your hunting experiences in Montana are not worth the extra expense, but I will not miss you." The fact that you would publish such a statement leads me to wonder if that is also the attitude of FWP. And does not the resident hunter realize that a significant portion of the department's budget comes from nonresident fees, and that the financial contribution of nonresidents traveling to Montana to hunt and fish is a very important income source to the state?

James Allred
Paradise Valley, AZ/Darby, MT

A large part of FWP's budget comes from nonresident license fees, and the department certainly welcomes nonresident hunters and anglers. Montana Outdoors *does not censor letters, even those in which the writer's opinion differs from FWP's.*

For the good of the future

As is the case with so many of your articles, I very much enjoyed "Shining a Light on Moose," in the March-April issue. As a hiker and hunter, I love knowing that FWP cares so much about wildlife management and conservation. I would like nothing more than to harvest a moose, for the meat as well as the experience. The hunting that I do is mainly to fill the freezer for my large family of seven. But if taking a moose meant that these animals wouldn't be around for my children and grandchildren, I would pass in a heartbeat. That is what I think you guys capture so well: the concept that most of us hunters are conservationists.

Dr. Jarrod Fancher
Missoula

Some consequences

It's unfortunate that the recent increased cost of Montana's nonresident hunting licenses is causing so much discord between resident and nonresident hunters. I have been welcomed by many resident hunters at camps in Montana's elk and deer country, despite my lowly status as a nonresident. I've made friends and shared food, drink, and stories. I hope this continues.

Last fall I was courted by the state of Colorado via a mailing that promised cheap licenses, abundant public land, and opportunities to hunt a thriving elk herd. Despite this, I trekked to Montana and once again enjoyed the hunt and the hospitality of residents. I got an elk. I also mooched beer and a campfire off a party of hunters from Billings and was "forced" by a group of Kalispell hunters to help finish off an oversupply of grilled 4-H–raised lamb chops with mint jelly and asparagus.

Still, there were consequences. Neither of my sons could afford to make the trip with me, and they said the increased fees were a big reason. If I want them to accompany me in the future, we will have to reduce some trip expenses, like sleeping in the truck instead of motels and bringing food supplies from home.

I plan to continue hunting in Montana and subscribing to *Montana Outdoors*. But if I want to hunt with my sons, all three of us will have to spend less money on the hunt itself to cover the increased fees. I have no quarrel with FWP, but I would prefer my money went to the nice folks who run small businesses like hotels, restaurants, and grocery stores and welcome me to their campfires every fall.

Mike Lein
Norwood Young America, MN

Huckleberry crisp and huckleberry tart

Prep Time: 30 min. and 20 min. | Cook Time: 40 min. and 30 min.

It's huckleberry season in western Montana. Roadside vendors around Columbia Falls and Seeley Lake are selling freezer bags of fresh berries. Cars are parked in strange locations on mountain roads. Kids, their teeth stained purple, are hanging around ice cream stands.

Though nearly all hucks grow in the state's northwestern region, picking is a statewide calling. Just as Kalispell hunters head east to hunt pheasants in Plentywood and pronghorn in Carter County each fall, so do Glasgow and Billings huckleberry fans make a midsummer pilgrimage west across the Divide to prime berry patches in the Flathead and Kootenai National Forests.

Picking berries is easy, but it helps to know where in those 4.6 million acres to look. Some tips I've learned from huckleberry experts over the years:

- Huckleberries are most abundant between 3,500 and 7,000 feet.
- Look for conifer forests with roughly 50 percent tree cover. The berries ripen in open or semiopen areas of old burns, old clear-cuts, and avalanche chutes.
- Collect on south-facing slopes at lower elevations starting around mid-July, then move to other slopes and higher elevations as the season progresses.
- Those mysterious vehicles mentioned above? That's often a sign that pickers are in the area. Consider driving another half mile or so (in order not to encroach on their territory) before getting out to look around.
- As you pick, put the berries in a 1-quart plastic container with a U-shaped flap cut in the lid. Picking is often on hillsides. If you slip or stumble, your hard-earned hucks won't spill onto the ground.
- Keep in mind that humans aren't the only ones looking for huckleberries. Watch out for grizzlies, make noise, and carry bear pepper spray.

The recipes shown here are the two best I've found over the years. They have just the right mix of sweetness and fruit.

—Tom Dickson

HUCKLEBERRY CRISP

From Saveur, *a gourmet food, wine, and travel magazine*

INGREDIENTS

6 T. plus ½ c. granulated sugar
6 T. all-purpose flour
¼ c. rolled oats
¼ c. packed brown sugar
¼ c. chopped walnuts
1 t. lemon zest plus 2 t. lemon juice
¾ t. vanilla extract, divided
½ t. kosher salt, divided
¼ t. ground cinnamon
4 T. unsalted butter, softened
4 c. huckleberries
2 t. cornstarch
2 t. brandy
Vanilla ice cream for serving

PREPARATION

1. Heat oven to 350° F. Place four 6-oz. fluted ceramic ramekins (or other small ovenproof baking dishes) on a baking sheet lined with parchment paper.

2. In a medium bowl, combine 6 T. sugar, flour, oats, brown sugar, walnuts, lemon zest, ¼ t. vanilla, ¼ t. salt, and cinnamon. Using your fingers, work the butter into the flour mixture until crumbly. Chill topping in freezer for 20 to 30 minutes.

3. In a large bowl, stir together the lemon juice and remaining sugar, salt, and vanilla, along with the hucks, cornstarch, and brandy. Divide berry mixture among the ramekins and mound some topping over each. Bake until the berries are bubbly and the topping is browned, 35 to 40 minutes. Let cool for about one hour. Serve with a scoop of ice cream.

HUCKLEBERRY TART

From Winston Greely, an FWP video producer, who learned the recipe (originally for lingonberries) while visiting Finland as a foreign exchange student.

INGREDIENTS

⅔ c. butter, softened
⅔ c. granulated sugar
1 t. salt
1½ t. baking powder
1½ c. flour
2½ c. huckleberries

PREPARATION

1. Mix first five ingredients in bowl. Form into a ball and roll out flat.

2. Mold into large tart dish or pie plate.

3. Add huckleberries.

4. Bake 30 minutes at 350° F.

5. Serve with whipped cream.

ANDRÉ BARANOWSKI

The Success of AIS Vigilance

In late May, FWP workers at a check station discovered small clamlike creatures on two construction barges that had arrived from Michigan for a cleanup project at Whitefish Lake.

The animals were zebra mussels. If allowed to gain a foothold in Montana, they could damage water-based recreation, ecosystems, and businesses across the state.

Fortunately, FWP's inspection program discovered the mussels before they had a chance to spread.

Zebra mussels are small mollusks native to Eastern Europe. Since first arriving on this continent in the early 1980s, they have wreaked havoc on lake and reservoir systems across the United States.

In one Kansas reservoir, the zebra mussel population exploded during the mid-2000s. In just three years, billions of the thumbnail-sized creatures covered every rock, log, and fishing pier in the reservoir. They ate up much of the zooplankton that forage fish need. As a result, game fish size and condition declined. Anglers began complaining about catching skinny walleye.

In Montana, we like our walleye plump.

That's one reason we are dead serious about keeping zebra mussels and other aquatic invasive species (AIS) out of this state's waters—and about preventing those already here from spreading further.

Containing the spread is an enormous task. AIS are spread by boats, engines, wading boots, and other gear used by mobile anglers, boaters, fisheries workers, bridge and dam contractors, and irrigators. People using Montana waters move to and from other Montana waters. And each year thousands of boaters, contractors, and anglers enter Montana from other states' lakes and rivers.

The stakes are huge. Like other invasives, zebra mussels lack natural predators to keep numbers in check. They jam boat engines, block water-intake pipes used by industries, clog irrigation systems, and disrupt water purification systems and hydropower plants. They also consume food and oxygen needed by native organisms. When they overpopulate and die, the mussels foul beaches with a putrid stench and razor-sharp shells.

Other serious AIS threats include:

- VHS virus, in the Great Lakes since 2005, causes large die-offs of warmwater species.
- Silver and bighead carp have spread north up the Mississippi River to tributaries such as the Ohio, Illinois, and lower Missouri Rivers. If they reach the Yellowstone, the oversized minnows could outcompete paddlefish, sauger, and sturgeon.
- Eurasian watermilfoil forms thick underwater plant beds that clog irrigation canals, block boating lanes, and render swimming areas unusable. The plant already occupies hundreds of acres of Noxon and Cabinet Gorge Reservoirs and has shown up in the Jefferson River and Fort Peck Reservoir.

Montana is fighting AIS on several fronts. You've likely seen the "Inspect. Clean. Dry." message on billboards and FWP vehicle tailgates. These and other public awareness efforts urge boaters to check their boats, boots, and other gear for mud, water, and plants that could carry AIS, and then to clean off all mud and vegetation before drying the gear to kill residual alien organisms.

Early detection is critical. By finding these species early, we have a much better chance of containing their spread.

That's what is happening at Whitefish Lake. FWP workers inspect and decontaminate barges, docks, tugboats, and other large pieces of equipment coming in from across the United States as part of an Environmental Protection Agency cleanup project. The goal of that inspection program is to ensure that no invasive species accidentally enter Whitefish Lake. So far, it's working.

Other AIS inspections are taking place elsewhere in Montana. Since mid-May, 45 FWP watercraft inspectors at 13 check stations have been examining watercraft near border crossings and on major travel routes.

In addition, the Montana Department of Agriculture and Department of Natural Resources and Conservation are cooperating closely with FWP on inspections and other AIS management efforts.

It requires a massive amount of work and coordination to keep zebra mussels and other AIS out of Montana waters. But that's what it takes, by FWP and everyone else who cares about lakes, reservoirs, and rivers. Otherwise a few pesky critters could quickly become a nightmare that all of us would have to live with for a very long time.

—**Joe Maurier**, Montana FWP Director

INSPECT. CLEAN. DRY.
STOP AQUATIC
HITCHHIKERS!
A message brought to you in cooperation by Montana Fish, Wildlife & Parks and Montana Department of Agriculture

Inspection is critical to stop AIS like zebra mussels from entering or spreading within Montana.

CHECK STATION PHOTO: FWP; BILLBOARD PHOTO ILLUSTRATION: LUKE DURAN/*MONTANA OUTDOORS*

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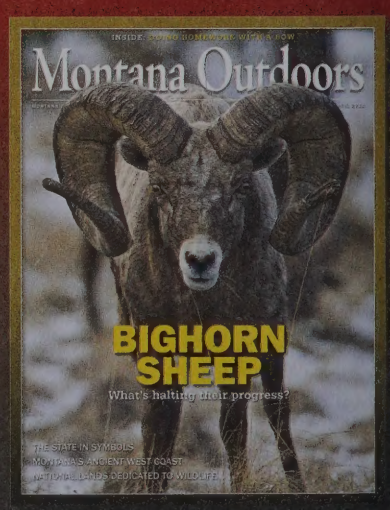

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ELIZA WILEY

Aerial surveys

JOE RAHN
FWP Chief Pilot, Helena

FWP HAS TWO FULL-TIME PILOTS, Neil Cadwell in Billings and me in Helena, and three part-timers. Mainly we fly wildlife population surveys. Most of the survey work is in January through late April, starting with moose and then mule deer, elk, bighorn sheep, and mountain goats. This time of year, in midsummer, we're taking biologists out to look for radio-collared grizzlies and wolves and conduct antelope surveys. Summer is also when we use a helicopter to stock westslope cutthroat and other trout species in mountain lakes. In fall we take game wardens up for aerial surveys of suspected poaching activity. Most people don't know the department has this aviation unit, but Montana is a big state, and the only way to effectively monitor its fish and wildlife resources is from the air.

At 3,800 acres, the West Riverside, or Bonner, fire just east of Missoula was one of the largest in Montana last year. Missoula photographer **ROBIN POOLE** caught sight of the blaze the first night it erupted in late August. "I live just over the hill and could see the smoke as I was driving home," he says. Making sure he was not impeding fire trucks, Poole drove to a frontage road, set up his camera, and began shooting. "I was lucky because it was dusk and there was still some dark blue in the sky. And then there was that orange and yellow of the blaze. I think the orange color came from the waning effects of the setting sun behind that hill." The photographer says the fire continued burning for another four weeks. "It got to the point where I could see it from my house and was afraid it would reach us. Fortunately, firefighters got it out before that happened." ■

4½

Length, in inches, of a wolf paw print (not including claw marks), compared to 3 inches for a Labrador retriever.

What's that sound?

A new study co-written by a University of Montana (UM) scientist may hold clues to determining a river's health and how salmonids navigate. The study examined the underwater sounds produced by five rivers in Europe and North America, including the Middle and North Forks of the Flathead River. UM associate professor Mark Lorang and a Swiss colleague used hydrophones to listen to the distinct "sound signatures" of riffles, runs, and pools in streams with different bottom composition. Lorang says further research could help gauge sediment loads and provide clues about the ways trout and salmon use audio signals to find spawning tributaries or locate fish ladders to circumvent dams.

FWP biologists Tim Thier and Tim Manley taking the sick caribou home

WILDLIFE RESCUE

FWP biologists save caribou, return it to B.C.

This past spring, FWP biologists in northwestern Montana learned that a woodland caribou wandering south from British Columbia into the Salish Mountains south of Eureka appeared to have died. A GPS collar confirmed the animal came from a herd of 19 caribou released a month earlier in southern British Columbia near Cranbrook to augment an existing herd. British Columbia biologists told their FWP colleagues the collar was emitting signals that indicated the animal had not moved for many hours.

On April 26, three FWP biologists snowmobiled up the Pinkham Creek drainage then hiked farther to retrieve the animal. They were surprised to find that the female caribou was in fact alive, though unable to stand or even hold her head up. "She seemed near death," says Tim Thier, FWP biologist in Eureka.

After the animal was transported to a veterinarian, several engorged ticks were found on her head. The caribou likely suffered from tick paralysis, caused by a neurotoxin produced in the insect's saliva gland. After the ticks were removed and the caribou received IV fluid, she regained strength and was driven to British Columbia. Crews there helicoptered the caribou back to the high Purcell Mountains to join the rest of the herd.

Though woodland caribou once roamed parts of northwestern Montana, the species is now considered extirpated (locally extinct) in all of the lower 48 states except for a small herd in the Selkirk Mountains of northeastern Washington and northwestern Idaho. Thier says two herds of caribou live in southern British Columbia within 40 miles of the international border. "Occasionally one of them wanders into Montana," he says. "I don't think many Montanans know we have caribou so close to us." ■

See it, love it, save it

TRAVELERS for OPEN LAND
A FUND TO CONSERVE MONTANA'S NATURAL HORIZONS

Visitors to Montana can help preserve the grand open vistas that make this state such a visual joy. The Travelers for Open Land project is a voluntary partnership among the traveling public, businesses, landowners, and land trust organizations. The goal? Conserve open spaces, wildlife habitat, working ranches, and recreational lands. Learn more at travelersforopenland.org.

PARTNERSHIPS

Montana donates sage-grouse to struggling Alberta population

Sage-grouse are faring well in parts of Montana, but north of here the birds have all but disappeared. Recently, FWP biologists teamed up with a Canadian crew to successfully capture 31 sage-grouse in Montana and release them in Alberta.

The birds were taken from Bureau of Land Management property in southern Valley County and released in the southeastern corner of Alberta. FWP says Valley County and adjacent Phillips County combined are home to roughly 15,000 sage-grouse. The ones sent across the border won't be missed.

In Canada, sage-grouse are classified as an endangered species. Numbers in southeastern Alberta have declined by roughly 80 percent since 1970. Biologists in that province asked Montana for a few dozen birds to help augment struggling populations. Nine were transplanted in 2011.

The birds were located in the daytime on breeding display areas known as leks, says Kelvin Johnson, FWP biologist in Glasgow. Then, driving in all-terrain vehicles, biologists returned to the leks at night and spotlighted the birds, capturing them with long-handled nets. The sage-grouse were fitted with GPS transmitters so Canadian biologists can follow them and learn survival rates and reproductive success.

Johnson says the release area has good sage-grouse habitat but a low population. "If enough of those birds are successful at nesting and pulling off broods, we may have the opportunity to do more of this in the future," he says. ■

FUNDING

75 years of conserving wildlife

In the late 1930s, conservationists and industry leaders across the United States agreed to a new tax that would raise money to conserve the nation's rapidly diminishing wildlife populations. The federal act that collects and distributes those funds, Pittman-Robertson, or PR, celebrates its 75th anniversary this September.

Pittman-Robertson, named for its conservation-minded sponsors in Congress, grew out of concern by hunters and the firearms industry that states needed a stable funding source to reverse the declines of elk, pronghorn, deer, wild turkeys, and other wildlife. The federal legislation, signed by President Franklin D. Roosevelt in 1937, directed an existing federal excise tax on firearms and ammunition to fund state wildlife projects.

"For Montana and every other state, it was pretty much the beginning of modern wildlife management," says Ken McDonald, FWP Wildlife Bureau chief. "For the first time, conservation agencies had funding to hire trained biologists and conduct scientific research."

The act was expanded in 1970 to include an excise tax on handguns, handgun ammunition, and archery equipment. The federal government collects the taxes, and the U.S. Fish & Wildlife Service redistributes the funds through the Wildlife and Sport Fish Restoration Program to states based on their size and the number of hunting licenses sold.

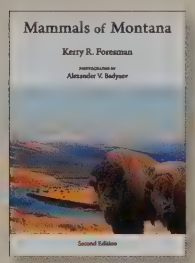
In Montana, funds from Pittman-Robertson and the similar Dingell-Johnson Act, passed in 1950 for fish conservation, and associated amendments, provide roughly $18 million to FWP per year, 25 percent of the department's fish and wildlife budget. FWP uses the funds to acquire and improve fish and wildlife habitat, maintain wildlife management areas, monitor fish and wildlife populations, conduct research, and provide hunting safety and fishing education programs.

"Without this self-imposed tax, hunters and anglers wouldn't have the incredible fish and wildlife populations in Montana that are here today," says McDonald. ■

New Montana mammals book now available

Ordinarily *Montana Outdoors* waits until the November-December issue to recommend books, but this one is too important to delay. The most comprehensive guide to Montana's bears, cats, canids, mustelids, and other mammals, *The Wild Mammals of Montana*, has been thoroughly updated and is being released this summer by Mountain Press Publishing in Missoula as *Mammals of Montana*.

The new 440-page edition, which sells for $32 ($24 if ordered before July 15), includes more than 500 photographs showing unique behaviors and habitats of Montana's 109 different mammal species.



Author Kerry Foresman, the resident mammalogist for the past 28 years at the University of Montana (UM), says the new edition contains extensive data obtained from research conducted over the past decade. The new information comes from FWP (elk, bighorn sheep, black and grizzly bears, mountain lions, bats, and prairie dogs), the Montana Natural Heritage Program (statewide small mammal surveys), the U.S. Forest Service (lynx and wolverines), and Foresman and UM graduate students (including swift fox, northern river otters, and porcupines). "Enormous gains have been made by researchers since the original book was published 11 years ago," Foresman says. "We've even been able to add a new mammal species, the northern short-tailed shrew." Order the book at montanamammals.com.

CLOCKWISE FROM TOP LEFT: ILLUSTRATION BY MIKE MORAN; MONTANA FWP; MONTANA FWP; MARK LORANG

BEWARE THE DEADLY TALON

Neck-breaking, disemboweling, constricting, and snagging—the violent world of raptors. BY ED YONG

FERRUGINOUS HAWK PHOTO: ISTOCKPHOTO.COM; TALON PHOTOS: MSU AND *PLOS ONE*

DEATH FROM ABOVE A study by Montana State University researchers looked at the many ways various raptors like this ferruginous hawk use their curved claws to capture and kill prey.

The role of *Velociraptor*'s infamous claws have received much scientific and pop culture fanfare ever since they clicked their way across a movie kitchen floor. In comparison, the formidable claws of modern raptors (birds of prey) have received little notice. Eagles, hawks, falcons, and owls are some of the most widespread and well-liked of all birds. Though it's always been suspected that these superb hunters use their talons to kill, we've known amazingly little about their techniques.

Paleontologist Denver Fowler and colleagues from Montana State University have changed some of that through the first comprehensive study of raptor feet. Their work in the late 2000s reveals that these familiar birds use a wide variety of killing strategies, including a few rather grisly ones. Some raptors use their talons to attack with high-speed killing blows, while others suffocate their prey to death in a constricting grip. Some give their victims the merciful death of a broken neck, but others eat their victims alive after slashing them open.

Fowler unveiled this macabre and violent world by measuring and photographing the talons and feet of 34 birds from 24 raptor species. He also studied more than 170 video sequences of raptor attacks, as well as many published accounts of predatory activity. By linking shape and size to actual behavior, he managed to document the wide range of uses that curved claws can be put to.

Fowler found that all raptors use their talons in a similar way when tackling small prey: Their feet imprison the victim, with talons deployed as a cage rather than as weapons. Falcons then use a notched ridge on their upper beak—the "tomial tooth"—to sever the spine or crush the head, while owls sometimes break their prey's neck with a swift twist. Accipitrids (eagles, hawks, kites, harriers, and the like) have weaker bites than falcons and no "tooth," so they use their feet to constrict their prey, cutting off the air supply much like pythons use their coils.

Because owls tend to ambush their prey on the ground, their chances of landing a killing blow are slimmer. Their feet have evolved to better restrain struggling prey. Their toes are shorter and stronger than those of other raptors. One toe can swivel backward to join another so the owl can grip with two pairs of opposing talons. That makes them powerful constrictors, capable of crushing small animals in a suffocating "fist." It also means they specialize in smaller victims, rarely tackling the larger prey that falcons and eagles hunt.

Larger prey simply can't be enclosed by feet, so falcons and accipitrids use different strategies when their meals get bigger. They'll stand on top of the animal, pinning it down with their full body weight. If the prey tires and stops moving, it's all over, but death only comes after a "prolonged and bloody scenario." The raptor plucks any fur or feathers, especially around the belly, and starts to feed, often using the large second claw to slash open the body and expose the innards. Grimly, the prey is sometimes still alive when

Goshawk

Osprey

Ed Yong is a London-based science writer. Adapted from an article that originally appeared on his blog Not Exactly Rocket Science, *blogs.discovermagazine.com/notrocketscience/. Used with permission.*

this happens. It's only the ensuing blood loss or organ failure that finishes it off.

Accipitrids are more likely to consume their victims alive. To subdue any final struggles, they have two unusually massive talons on the first and second toes that provide extra grip. These piercing anchors give them the ability to cope with the most powerful struggling prey, and it's no coincidence that the accipitrids include the mightiest of the raptors.

Falcons, on the other hand, often kill their prey with a neck-break to avoid a protracted struggle. They specialize in high-speed assaults, striking their prey with rapid dives and swoops that can potentially cripple or even kill the victim outright. Peregrines and other falcons can afford to have smaller talons because their prey is more likely to be immobile once it hits the ground.

Aside from size, the type of prey matters little in determining the shape and proportion of the raptor foot. The only exceptions are species that are fish snagging specialists, such as the osprey and the bald eagle. Their talons are like fishhooks—exceptionally large, highly curved, and equal in size on all four toes.

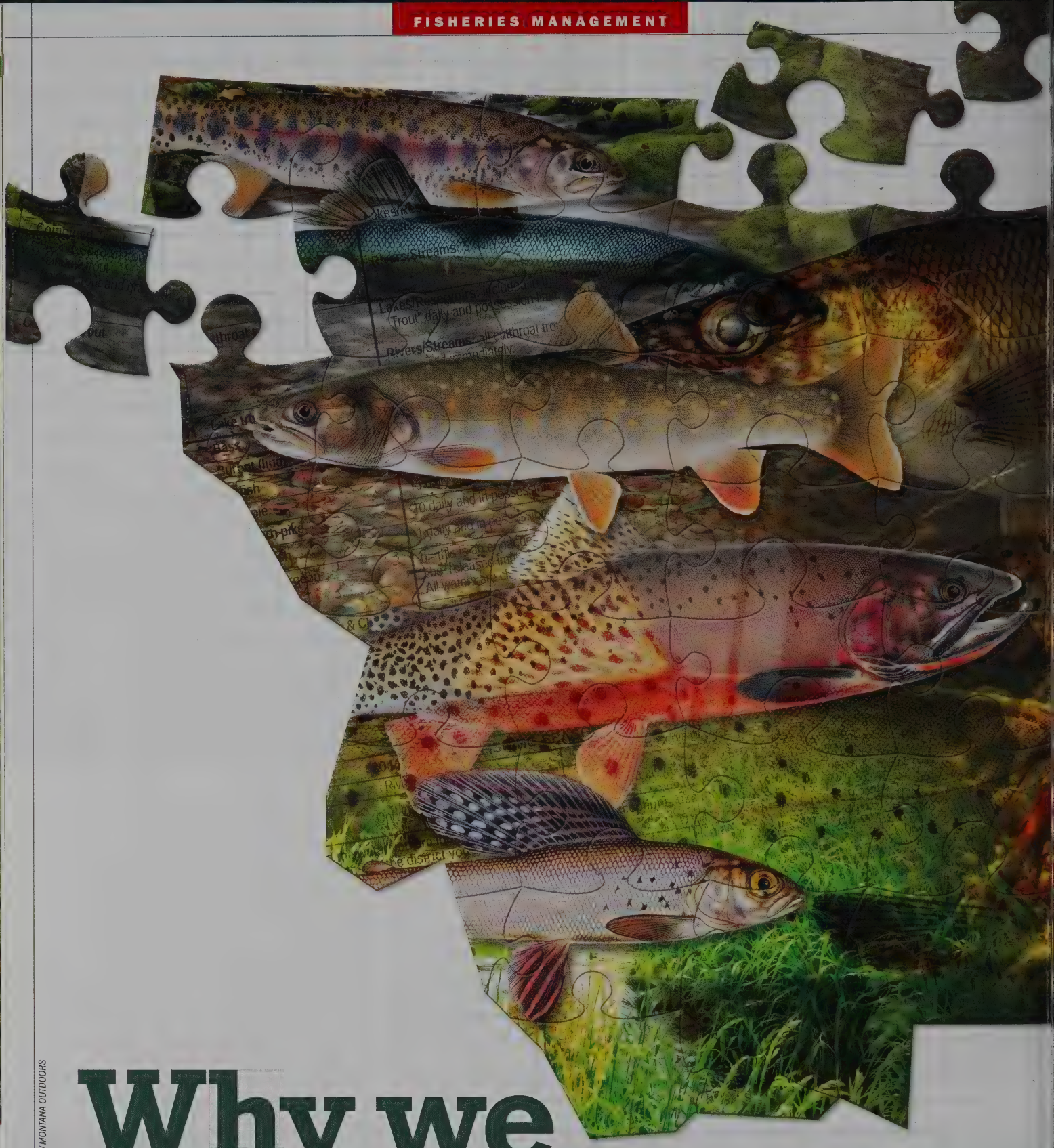
Considering how popular and common birds of prey are, it's amazing that a study like this has never been attempted before. Even now, Fowler sees it as just the beginning. There's no reason why the same sort of analysis shouldn't apply to the extinct relatives of today's raptors, meat-eating dinosaurs, a theory that forms the plot of his sequel study.

Results of Fowler's sequel study were recently published in the scientific journal PLoS ONE. *He and fellow MSU researchers describe how comparing modern raptors helped them develop a new behavior model for sickle-clawed carnivorous dinosaurs like* Velociraptor. *Look for more on the scientists' research in an upcoming issue of* Montana Outdoors.

Peregrine falcon

Red-tailed hawk

Great gray owl



Why we do it this way

PHOTO ILLUSTRATION BY LUKE DURAN/*MONTANA OUTDOORS*

FWP unveils a new plan that explains the agency's approach to managing Montana's diverse and complex fisheries. **BY TOM DICKSON**

By catching a trout, walleye, or other game fish, an angler can easily see the results of how Montana Fish, Wildlife & Parks manages the state's fisheries.

An angler can also find evidence of the department's decisions in the fishing regulations booklet. Its pages are filled with information on open and closed areas, possession limits, bait constraints, and other restrictions designed to protect fisheries and improve angling recreation.

What's never been easy, however, is figuring out the *reasoning* behind FWP's fisheries management decisions and activities.

That's about to change.

FWP will soon unveil the draft of a new statewide fisheries management plan that will clarify what the department does and why. "This is about transparency as much as anything," says Bruce Rich, FWP Fisheries Bureau chief. "We're about to put on paper our existing management directions, open them to public review, and then commit to those decisions for the next five years."

The proposed plan, which will be available for public comment early this fall, divides Montana's fisheries among 40 drainages. For each drainage (and major waterbody within a drainage), the plan lists what Rich calls "prescriptions," or the general actions biologists use to protect, restore, and improve various fish populations. "The prescriptions are like the road maps biologists can consult as they decide how best to manage local fisheries," he says.

Equally important, says Rich, is the background information the plan provides that explains the reasoning behind prescriptions in each drainage. For instance, FWP recently changed fishing regulations in the upper Bitterroot River drainage in ways that increase the brown trout harvest. "Most anglers wouldn't know why we made those changes, that we want to reduce the brown trout population in order to lessen competition with native bull trout and westslope cutthroat trout populations," says Rich. "In the new plan, they'll be able to find the rationale for that and every other regulation."

Rich wants the information to assist anglers and others in discussions with FWP on fisheries management issues and activities. "This won't be the 'shelf art' that so many plans end up becoming," he says. "We intend for it to be a working document that our staff and the public can constantly refer back to."

Many factors go in

The health of native fish populations like bull trout and cutthroat trout is just one of many components FWP biologists must consider. As the new plan will make clear, they also take into account the

- number and type of fish in a waterbody and how those species interact;
- requirements imposed by state and federal laws;
- likelihood of species such as arctic grayling and westslope cutthroat trout becoming federally listed;
- effects of drought and low water levels;
- threats of fish disease and aquatic invasive species;
- growing numbers of illegal fish introductions;
- water and bank damage caused by growing riverside residential development;
- potential dangers of new oil and gas development; and
- long-term effects of hydropower dams.

In addition to these biological and environmental factors, biologists must balance the diverse and often conflicting expectations of anglers. For instance, a rainbow trout stream might produce more trophy fish, favored by some anglers, with tighter harvest restrictions on larger fish. Or it could produce more fish for the table, favored by other anglers, with more liberal harvest restrictions. But the stream can't do both.

"The complexity of what we have to take into account can be staggering," Rich says. "So we want to make clear to the public the reasoning behind what we do—and need to do, legally—to protect and improve fisheries while balancing the interests of the many different anglers out there."

Does news of a statewide plan mean FWP has been managing fisheries all these years without a rudder? "Not at all," says Rich. "But in many cases the plans and prescriptions for individual watersheds and waterbodies are stored in our biologists' heads. What we're doing now is documenting them and pledging to carry them out."

Tom Dickson is editor of Montana Outdoors.

Don Skaar, a senior Fisheries Bureau official in Helena who is managing the planning process, says the plan will provide readers with previously unavailable insight into FWP actions. It will explain why, for instance, the department stocks some lakes and reservoirs but not others. And how biologists decide which waters to restore with native species and which to retain with popular nonnative sport fish.

"Without a plan, our regulations and other actions can seem arbitrary, when in fact they are carefully thought through and carried out with extensive public input," Skaar says. "The idea is to explain that our management decisions are based on laws, rules, and policies that are shaped by scientific knowledge and our interactions with the angling public."

Skaar says that currently the only time the public gets to hear FWP's rationale for fisheries management decisions is during the often-contentious regulations-setting process. "Now they'll be able to read, anytime, the department's case for its actions," he says.

Many benefits come out

In addition to satisfying anglers' curiosity about FWP decisions, the statewide management plan will have several other public benefits. One is to hold the department accountable. As Rich says, "We're making a public commitment with this document."

Another is that the plan will give the public confidence that current fishing opportunities won't suddenly change. "A huge amount of public involvement has already gone into the way we're managing Montana's fisheries," Rich says. "Those fishing opportunities are vulnerable in the sense that much of the reasoning behind how we are managing them isn't documented anywhere."

The lack of an established plan, Rich explains, makes it difficult for biologists and local anglers to maintain popular management approaches. "But if that rationale is in an FWP planning document, the public can have confidence that their fishing traditions won't be changed all of a sudden just because a few anglers decide they want to catch a new species they saw on a TV show."

We are constantly weighing a wide range of factors and trying to find a reasonable and sustainable balance."

According to Rich, the plan will also save time and reduce conflicts during the annual regulations-setting process. "We often hear the same arguments from and between various angling constituencies each time we need to adjust a regulation or make some other decision," he says. "With this plan we hope to resolve those conflicts early on, get whatever resolution we can into the plan, and then base future decisions in part on that, instead of revisiting the conflicts every time we reach a new decision point. That way we and the majority of anglers can say, 'Look, we've been through this before, we've discussed it at length and had lots of public input, and here is our decision. So let's move on.'"

As an example, Skaar points to a recent increase in nonnative northern pike in the Missouri River up- and downstream from Toston Reservoir. In May FWP announced plans to remove as many of the predator fish as possible, using gill nets and electrofishing. "Under the plan, the prescription for that drainage is to suppress northern pike," Skaar says. "The rationale is to protect the world-class trout fishery in the Madison, Jefferson, and Gallatin Rivers and the popular rainbow trout and walleye fisheries in the upper reservoirs. By having that prescription down in print, we won't have to revisit it every year. It allows us to be proactive in responding to species that don't belong there."

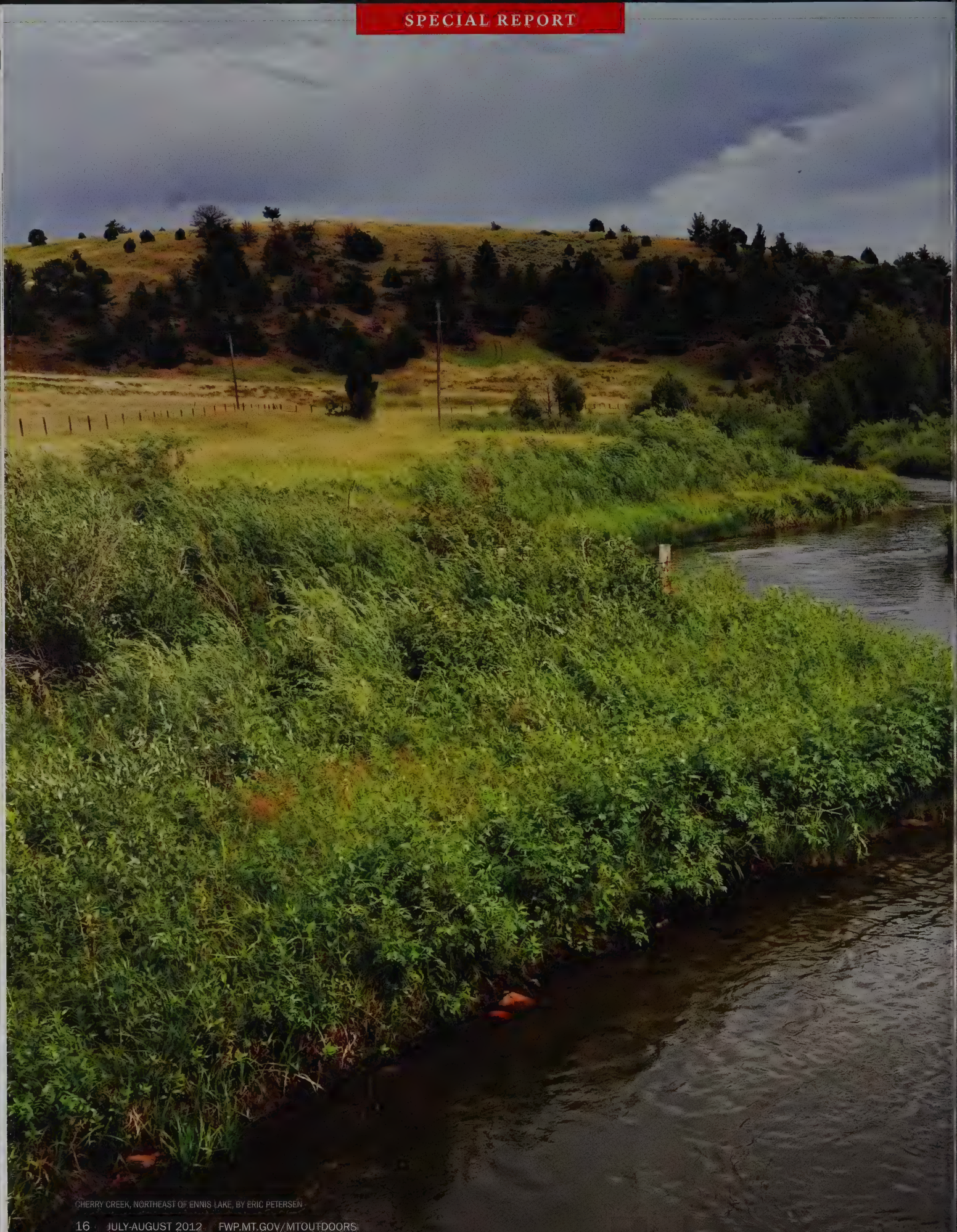
Adapting to circumstances

Rich says the plan will also help reinforce FWP's flexible approach to fisheries management. "We're not single minded, focusing just on native species or just on sport fish. We adapt as circumstances dictate," he says. As an example, Rich notes that FWP strongly urges the U.S. Corps of Engineers to release warmer water down the spillway of Fort Peck Dam to benefit sauger, pallid sturgeon, and paddlefish in the Missouri River downstream. "But 200 miles to the south, on [the Bighorn River's] Yellowtail Dam, we want releases of cold water," says Rich. "There we have no intention of restoring the native warmwater fishery in the tailwater section of the river, because that would be detrimental to what's become a world-class rainbow and brown trout fishery.

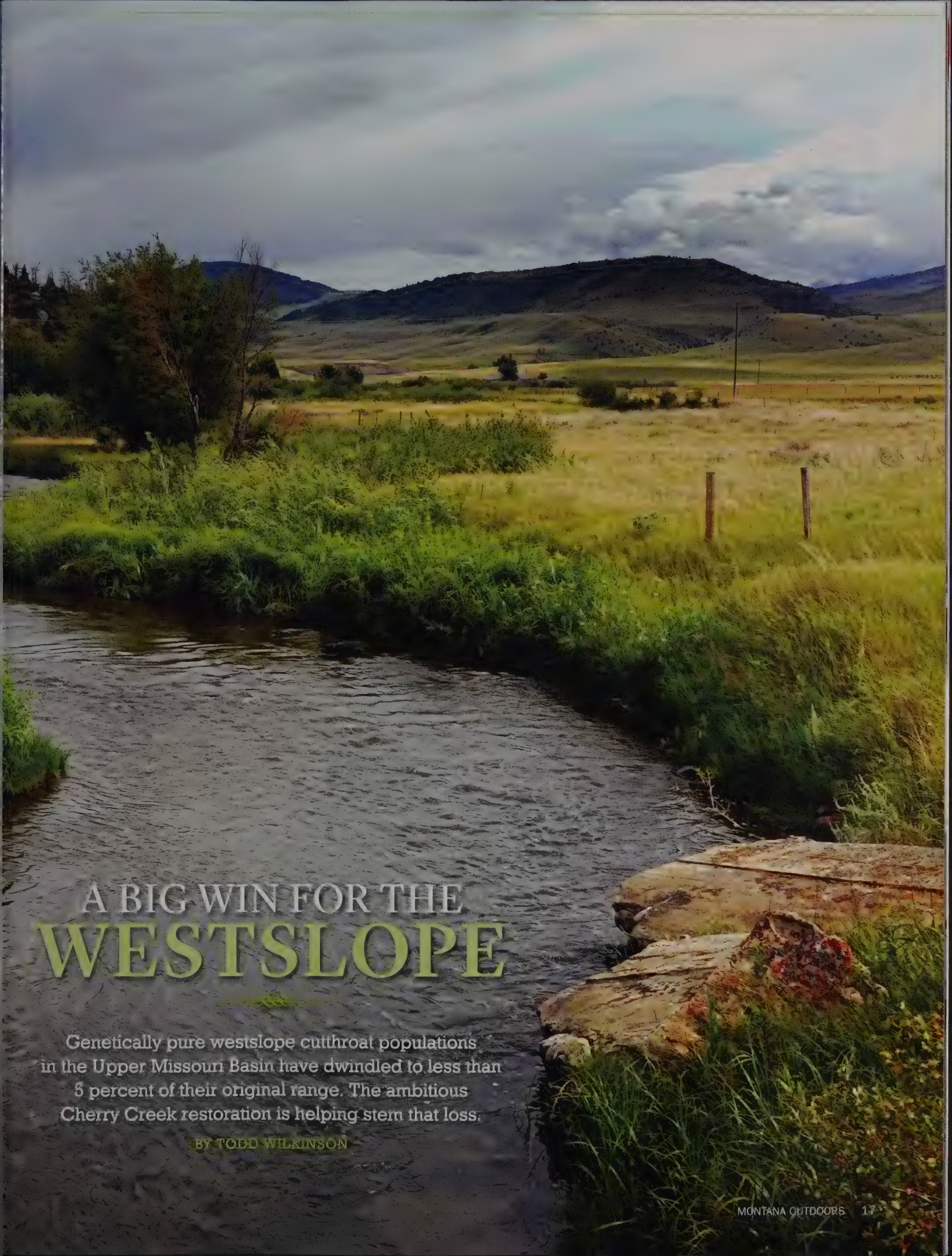
"The point," Rich explains, "is that we are constantly weighing a wide range of factors and trying to find a reasonable and sustainable balance that's good for fish populations and the wide diversity of angler expectations out there."

Explaining what those factors are, and what the department means by "balance," are in part what FWP wants the proposed statewide fisheries plan to accomplish.

The proposed statewide fisheries plan will be available for public comment and review this fall. For more information, visit the FWP website at fwp.mt.gov.



CHERRY CREEK, NORTHEAST OF ENNIS LAKE, BY ERIC PETERSEN



A BIG WIN FOR THE WESTSLOPE

Genetically pure westslope cutthroat populations in the Upper Missouri Basin have dwindled to less than 5 percent of their original range. The ambitious Cherry Creek restoration is helping stem that loss.

BY TODD WILKINSON

Pat Clancey and Carter Kruse are hiking along the upper reaches of Cherry Creek, where its course jags northward and tumbles out of the Spanish Peaks foothills northeast of Ennis Lake. The creek will eventually join the Madison River in the lower end of Bear Trap Canyon a dozen miles downstream.

Clancey is a longtime fisheries biologist for Montana Fish, Wildlife & Parks in Ennis; Kruse is the aquatic resources manager for Turner Enterprises, Inc. As the pair weave between pellet piles left by elk and mule deer on a game trail, frogs leap into the water and a great blue heron lifts off, hang-gliding in the breeze. At a bubbling spring that feeds the creek, the two stop and peer into a clear pool alight with colorful cobble.

"Watch this," Kruse says. He snatches a few grasshoppers off stems of wild brome and tosses them one by one into the stream. As they land on the water, small trout dash to the surface and engulf the insects before returning to hiding spots in the current.

"They may be little now, but they're the future," Kruse says of the abundant fish. These aren't just any trout. They are westslope cutthroat, a species that has disappeared from much of its home range in Montana east of the Continental Divide. The taxonomic name for westslope cutthroat, *Oncorhynchus clarkii lewisi*, hints at a rich history. It honors Meriwether Lewis and William Clark, who documented the black-spotted beauties in 1805 at the present site of Great Falls. The species is also Montana's state fish.

A few years ago not a single westslope cutthroat lived in Cherry Creek. The fish Kruse and Clancey are watching today were introduced in 2006 as eggs taken from wild stocks in other waters, after FWP removed brook trout, rainbow trout, and Yellowstone cutthroat from Cherry Creek. The westslope cutthroat are there because of what fisheries professionals and trout conservationists are calling one of the most ambitious public-private native trout conservation projects in the United States. "Montana has a long history of thinking and acting boldly when it comes to fisheries management," Clancey says. "The Cherry Creek restoration is definitely part of that tradition."

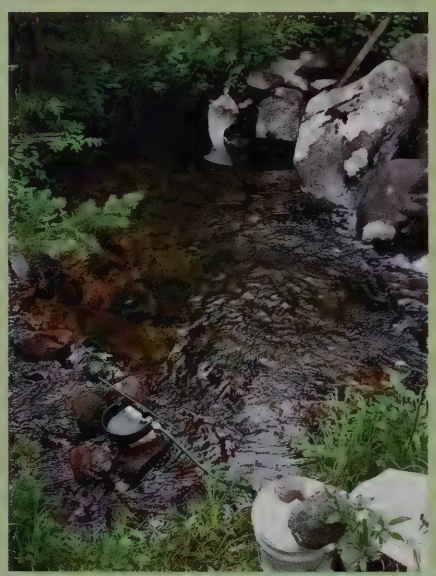
Todd Wilkinson of Bozeman is a correspondent for the Christian Science Monitor *and has written for the* Wall Street Journal, U.S. News and World Report, *and* Audubon.

Steep decline

While westslope cutthroat in Montana appear to be holding their own west of the Continental Divide, they've declined significantly on the east side throughout the Upper Missouri River Basin. The main reason: competition and hybridization with nonnative rainbow, brown, brook, and Yellowstone cutthroat trout, first stocked in the early 20th century. According to Lee Nelson, coordinator of FWP's Native Fish Program, genetically pure westslope cutthroat no longer exist in 95 percent of their historic range in the Upper Missouri watershed.

In 1997 concerned citizens and conservation groups petitioned the U.S. Fish & Wildlife Service (USFWS) to list the westslope cutthroat as threatened under the federal Endangered Species Act (ESA). That prompted a status review across the subspecies' known habitat in the Pacific and Intermountain Northwest. Though the agency eventually determined that federal listing was "not warranted," the review pointed to declining numbers in several parts of the region, including the Upper Missouri River Basin. If populations continued to shrink, federal listing remained a possibility.

A year before the federal review, FWP had begun looking into reestablishing westslope cutthroat in tributaries of the Madison River. "The idea was that replicating and expanding wild populations in those streams would expand their distribution, increase their num-



NATURAL NURSERY Left: To restore Cherry Creek, FWP first applied rotenone at drip stations (in white bucket through green hose). The piscicide was used to kill all existing trout, which were not native to the watershed. "Sentinel" fish (in net bag) were used to test the effectiveness of rotenone drip stations farther upstream.

Below: FWP fisheries workers collected eggs from wild westslope cutthroat in small streams elsewhere in southwestern Montana. The eggs were incubated at a private hatchery on the Sun Ranch south of Ennis for several weeks until reaching the "eyed" stage. Fisheries workers placed the eyed eggs in remote streamside incubators (round white bucket) on Cherry Creek and its tributaries, where they hatched into fry and swam into the streams. "This method allows the developing eggs to imprint on the chemical composition of the water just as if they had been laid there naturally," says FWP fisheries biologist Pat Clancey.

PHOTOS BY PAT CLANCEY/FWP; MAP ILLUSTRATION BY LUKE DURAN/*MONTANA OUTDOORS*

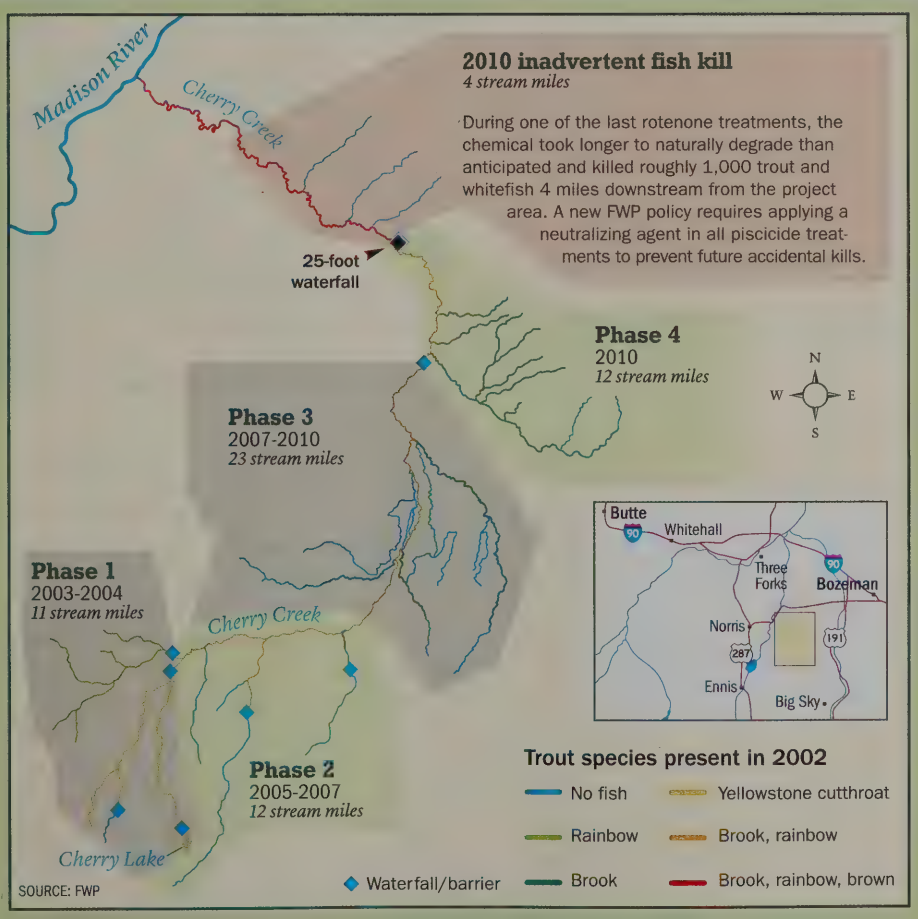
bers, and reduce the likelihood that a catastrophic event or genetic inbreeding would eliminate local populations," says Clancey. "Also, we thought that as westslope cutthroat reestablished themselves in those tributaries, some would move down into the Madison River." That would provide an additional fishery in the Madison River, where the rainbow trout population was declining from whirling disease.

> **"Montana has a long history of thinking and acting boldly when it comes to fisheries management."**

The following year the agency learned that a major private Montana landowner wanted to help restore westslope cutthroat in the Madison Basin. The surprising offer came from media-mogul-turned-bison-rancher Ted Turner. Turner and his son Beau had heard about the plight of westslope cutthroat from FWP reports and knew about the whirling disease infestation in the Madison River. Concerned that a similar disease could wipe out isolated pockets of westslope cutthroat, Turner proposed partnering with the state to pursue something never before attempted—turning an entire drainage into a new stronghold for the native trout.

At 113,000 acres, Turner's Flying D Ranch southwest of Bozeman contains most of Cherry Creek and its secondary tributaries. Clancey, who became the lead field supervisor for the Cherry Creek westslope restoration project, called the proposed opportunity "breathtaking," because it would create the largest intact watershed with westslope cutthroat in the Upper Missouri Drainage.

Historically, Cherry Creek was barren of westslope cutthroat and other fish above a 25-foot waterfall 8 miles upstream from its confluence with the Madison River. Brookies, rainbows, and other trout species not indigenous to the area were stocked in the fishless creek starting in the early 1900s. If those trout could be removed and replaced with pure westslope cutthroat, the restored population would remain protected—by the natural barrier formed by the falls—from the threat of nonnative trout moving up from the Madison. Renovating Cherry Creek promised to significantly increase the total mileage of streams east of the Divide harboring pure-strain westslopes. What's more, the creek could serve as a secure, self-sustaining reservoir of wild fish that could become seed stock for expanding pure westslopes elsewhere in the Missouri River Basin.



OPERATION REMOVE AND REPLICATE Fish were eliminated from Cherry Creek and its tributaries in four phases, beginning in 2003. In each phase, fisheries workers applied rotenone to kill all nonnative rainbow, brook, and Yellowstone cutthroat trout first stocked in the early 1900s. Historically Cherry Creek was fishless upstream from a 25-foot waterfall that prevented fish from moving up from the Madison River. The falls will now prevent nonnative trout from entering the restoration area.

Daunting challenge

Turner's offer was embraced by FWP under three different agency directors and both Republican and Democratic governors spanning more than a decade. The most daunting challenge was the project area's vast size. No one had ever tried to remove fish and replace them with westslope cutthroat on such a scale.

The plan called for applying piscicides (fish toxins) to the entire Cherry Creek system, from its origin at Cherry Lake high in the adjacent Lee Metcalf Wilderness downstream to the waterfall. The chemical treatment would eliminate all the hybridizing and competing nonnative trout to make way for westslope cutthroat.

Despite his enthusiasm for restoring westslope cutthroat, Turner had reservations about removing existing nonnative trout. He had spent years restoring portions of Cherry Creek's riparian (streamside) corridor, degraded from decades of intensive cattle grazing by previous owners. He had watched the creek subsequently repopulate with

abundant trout—the very ones now targeted for eradication. But after listening to persuasive arguments from his son and others, the lifelong trout angler and coldwater conservationist realized he could, along with FWP and the U.S. Forest Service, make a historic contribution to westslope cutthroat recovery.

Turner's involvement raised the hackles of some Montanans, who argued the project would ruin a long-standing public recreational fishery to benefit a single species. The plans to apply piscicides also drew fire. Three different lawsuits, in state and federal courts, were filed primarily over use of the chemicals, claiming FWP would violate the Clean Water Act.

FWP argued in court that because the Flying D Ranch is private property well removed from public roads, bridges, and other access points, it draws few public anglers, and none within the westslope project area. Though the headwaters of Cherry Lake are on public (federal) land, FWP biologists were confident the new westslope cutthroat fishery would satisfy long-term angler needs.

As for rotenone and antimycin, the fish toxins, Clancey points out that both have been widely applied and well studied throughout the world for decades. Naturally occurring, rotenone is used by indigenous people in South America and the South Pacific to capture food fish. Both chemicals work by preventing fish, aquatic insects, and other gilled organisms from processing dissolved oxygen in water. They are harmless to other life forms, except in extraordinarily large dosages. Rotenone and antimycin break down in sunlight and are quickly rendered benign. What's more, fisheries workers can apply a neutralizing agent, potassium permanganate, at the downstream end of targeted treatment areas to stifle lingering toxic effects. Typically, rotenone and antimycin are fully neutralized within 30 minutes of contact with sufficient potassium permanganate.

Judges in all three legal challenges ruled in FWP's favor and allowed the project to proceed.

Legal hurdles cleared, FWP began the multiyear task of applying piscicides. Fisheries workers started at the top of the drainage in 2003 and moved downstream, in four separate phases over a period of eight years, using closely monitored drip stations. Nearly 60 miles of main-stem creek and secondary tributaries, some less than a foot across, had to be treated—and thoroughly. If even a few fish were missed, they could repopulate and ruin the westslope cutthroat restoration.

The annual piscicide treatments continued without a hitch until summer 2010. In one of the last rotenone applications, the chemical persisted farther downstream than fisheries workers anticipated. No potassium permanganate was applied that day. Biologists assumed the rotenone would self-neutralize before reaching the end of the project area, as it had in two previous applications at that same site. Roughly 1,000 trout and whitefish were killed for roughly 4 miles farther downstream than expected. Though some dead fish drifted down into the Madison, Clancey says no fish in that river were harmed. "The lethal effects ended about 3 miles up Cherry Creek from the confluence," he says.

FWP conducted a thorough review of the incident and afterward imposed tighter safeguards. "Our new standards now include mandatory use of potassium permanganate in piscicide treatments to prevent inadvertent fish kills in the future," Clancey says.

Resounding success

Each time biologists verified that all nonnative fish had been eliminated from a phase of the project, they introduced eggs collected from wild cutthroat populations elsewhere in the Upper Missouri drainage. The first eggs, planted in 2006, have now grown into healthy 10-plus-inch fish, Clancey says. And the trout are multiplying. "We've begun capturing young-of-the-year westslope cutthroat in the upstream reaches of Cherry Creek," he says. "That tells us the population is reproducing. It's a big step toward our goal."

Follow-up studies show that any aquatic insect populations harmed by the piscicides are recovering to pretreatment levels. That means newly restored trout will have plenty of food to eat.

And anglers will have plenty of fish to catch. Clancey is confident that within a few years anyone who previously fished Cherry Creek or Cherry Lake will see the same overall size and numbers of trout. "And the fish are moving downstream as we'd hoped," he adds. "We've seen photographs from anglers who have caught westslope cutthroat in the Madison near the mouth of Cherry Creek."

Biologists and conservationists have lauded the Cherry Creek restoration. "It's definitely a monumental achievement in native trout recovery," says Bruce Farling, executive director of Trout Unlimited's Montana State Council. "It was clear to us from the very beginning that the venture was extremely well planned and scientifically sound." The Montana Chapter of the American Fisheries Society (AFS) named Clancey its 2010 fisheries professional of the year and Turner its landowner of the year.

> **"What happened there is rare, but it doesn't have to be."**

Turner contributed more than $750,000 to cover roughly 75 percent of the Cherry Creek project costs. The rest came primarily from the U.S. Forest Service in the form of staff and equipment to help organize and carry out the project.

"The sheer scale of the project was remarkable," says Bruce Rich, FWP regional fisheries manager during most of the Cherry Creek project and now chief of the department's Fisheries Bureau. "Usually when we're able to do a nonnative fish removal and native restoration, it's on 10 or 11 miles of stream at most. We restored nearly 60 miles of the Cherry Creek drainage, including tributaries. It was a huge undertaking that took years to plan, coordinate, and execute."

Clancey notes that the Cherry Creek project offers inspiration for what can be accomplished elsewhere in Montana and other western states. "What happened there is rare," he says, "but it doesn't have to be."

WESTSLOPE CUTTHROAT TROUT BY JAY FLEMING

For more than a generation, Montana has been in the vanguard of wild trout management. It was the first state to stop stocking nonnative trout in streams and rivers in favor of perpetuating natural, self-sustaining populations. It has helped lead efforts to protect streamside habitat and in-stream flows. Unlike many states' "put-and-take" models of trout management, which pay little heed to water quality and habitat, Montana has long recognized wild trout as a reflection of their environment.

"Where you have westslope cutthroats you have good water quality, and where you have genetically pure westslope cutthroats you have the only trout species that were in that region 200 years ago," Clancey says. "We're losing places like that. But here's a case where, instead of trying to fend off cutthroat losses, we made a real significant gain."

The worth of a westslope

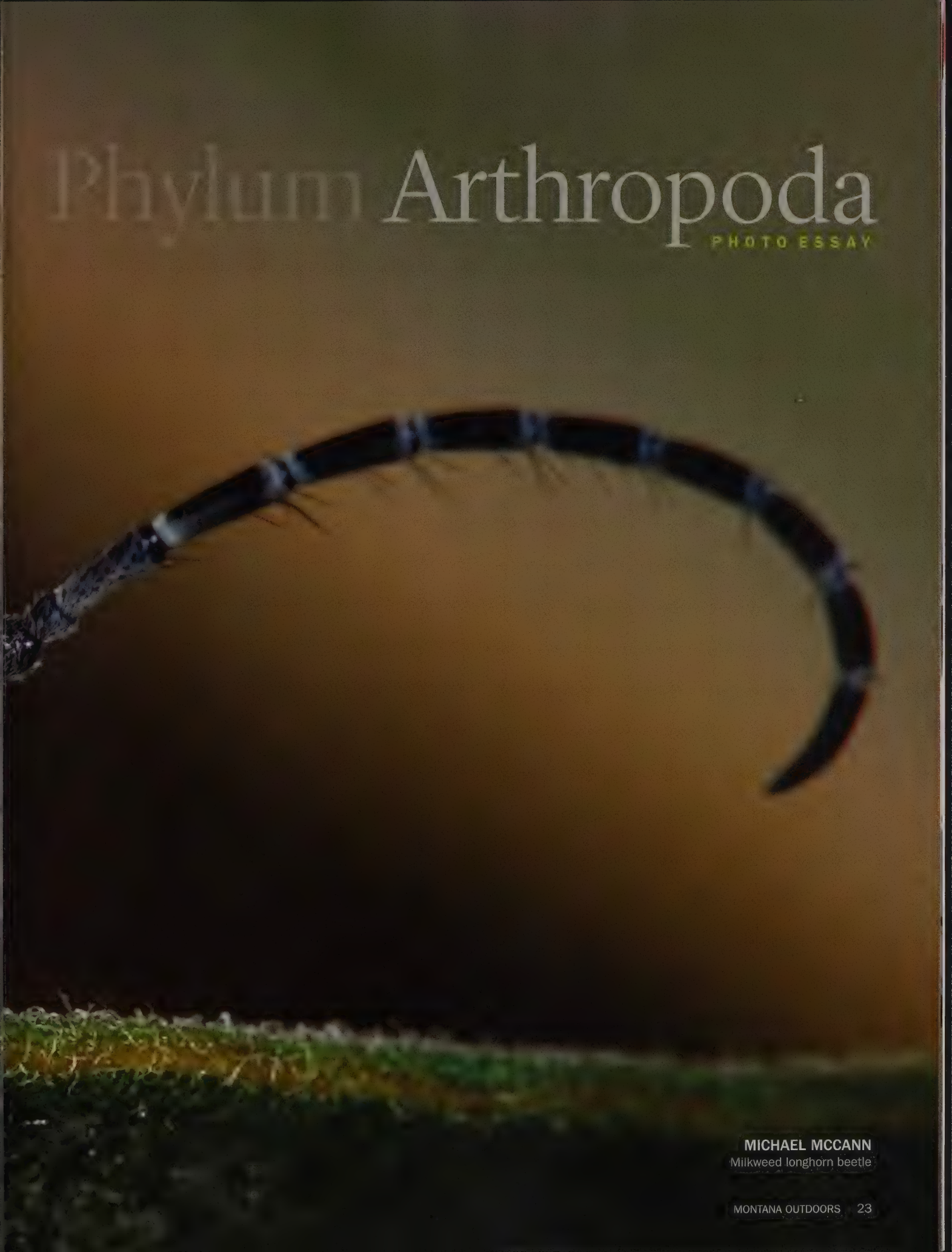
Lee Nelson, coordinator of FWP's Native Fish Program, notes that the Cherry Creek project and other westslope cutthroat restorations raise an important question: As long as it's a catchable fish, what difference does it make if a trout is a rainbow, a brookie, or a westslope cutthroat?

One reason FWP makes westslope cutthroats a priority, Nelson says, is to reduce the likelihood that the species will be listed as threatened under the ESA. But more important, he adds, is that westslope cutthroat are a fine and beautiful sport fish, part of Montana's cultural heritage. Then there's the argument that humans have an ethical obligation to the natural world, both now and down the road. "I think most people would agree that any species that has existed in an area for thousands of years has an inherent value and should be maintained for future generations," Nelson says.

The allure of something rare and special, that can be handed down like an heirloom from one generation to the next, is a powerful element of Montana's natural heritage. "Biologists and anglers will tell you that the opportunity to fish for a wild-spawned westslope is a wonderful experience that says a lot about the quality of habitats we have left in Montana," Nelson says. "It deepens Montana's mystique as a unique destination for native trout fishing."

Phylum Arthropoda

PHOTO ESSAY



MICHAEL MCCANN
Milkweed longhorn beetle

BECCA WOOD
Above: Crab spider

RON BOGGS
Below: Red tachinid fly

STRANGE AS IT MIGHT SEEM, some of the most beautiful animals that live in Montana are multi-legged beetles, moths, spiders, and other members of the phylum Arthropoda.

Arthropods come in a spectrum of colors, including bright yellows, shimmering blues, and metallic greens. Some of these small creatures use color to warn predators they are poisonous. Color also works as camouflage, such as when an orange butterfly folds its wings to reveal drab undersides (tricking a bird searching for the vivid specimen it saw moments earlier). Color allows certain arthropods to mimic bad-tasting species. Many use color to advertise their sex and species to potential mates.

This remarkable world goes on around us at all times, largely unseen. About the only way to witness its beauty is through a photographer's macro lens, which fills the frame with a tiny creature's entire body. Equally important to producing striking images like those shown here is the background, which a photographer can use to create contrast that heightens the subject's shape, complexity, and color.

Readers of this magazine regularly see stunning images of elk, grizzlies, and trout. Here and on the following pages are some of Montana's other spectacular wildlife.

—Editor

JOHN WINNIE, JR.
Golden flower longhorn beetle
on a wild mountain rose

BECCA WOOD
Common horse fly

JEREMY ROBERTS
White-crossed seed bug

JAIME AND LISA JOHNSON
Jumping spider

Clockwise from facing page:

JAIME AND LISA JOHNSON
Damselfly

RON BOGGS
Cecropia moth caterpillar

JOHN ASHLEY
Satyr angelwing butterfly

MICHAEL MCCANN
Toothpick grasshopper

AS THE TAMARACK TURNS Western larch, their golden needles aglow, reflect off still waters in the new Marshall Creek Wildlife Management Area near Seeley Lake. The public land is open year-round for hiking, wildlife watching, hunting, fishing, snowmobiling, and other recreation.

CHUCK HANELY

WHERE IT ALL COMES TOGETHER

Purchased last year with overwhelming local support, the new Marshall Creek Wildlife Management Area is home to grizzly bears, lynx, elk, and bull trout. The area attracts thousands of hunters, snowmobilers, campers, and anglers each year, making it a boon to local businesses. It's also one of the prettiest places you've ever seen.

BY TODD TANNER

Jay Kolbe and I started out below the clouds, down in the valley with the amber larch rising into the pre-dawn fog and a couple inches of new snow muffling every sound. We drove up old switchback logging roads, gaining altitude and reading tracks in the virgin powder: deer, mostly, moving in and out of the timber in their rush to feed in the wake of the previous day's storm. We kept climbing, Kolbe's pickup breaking trail, until we hit an overlook where the symmetry and sense of it all suddenly became obvious. Clouds filled the valley below, an ethereal sea of fog and shifting light hiding Seeley Lake, while in the distance the western edge of the Bob Marshall Wilderness framed a flawless Montana sunrise.

Kolbe, the local Montana Fish, Wildlife & Parks wildlife biologist, was taking the day off to hunt with me. We climbed out of his truck and stood amazed—the towering Mission Range rising to our backs, the elk and deer we'd come to hunt temporarily forgotten—as we took in the spectacular birth of a new day. You couldn't be there on that November morning, watching a perfect sunrise paint the landscape with luminescence, and not be in awe. It was as if the entire world had been remade while we slept and now all of existence was new and pure and white.

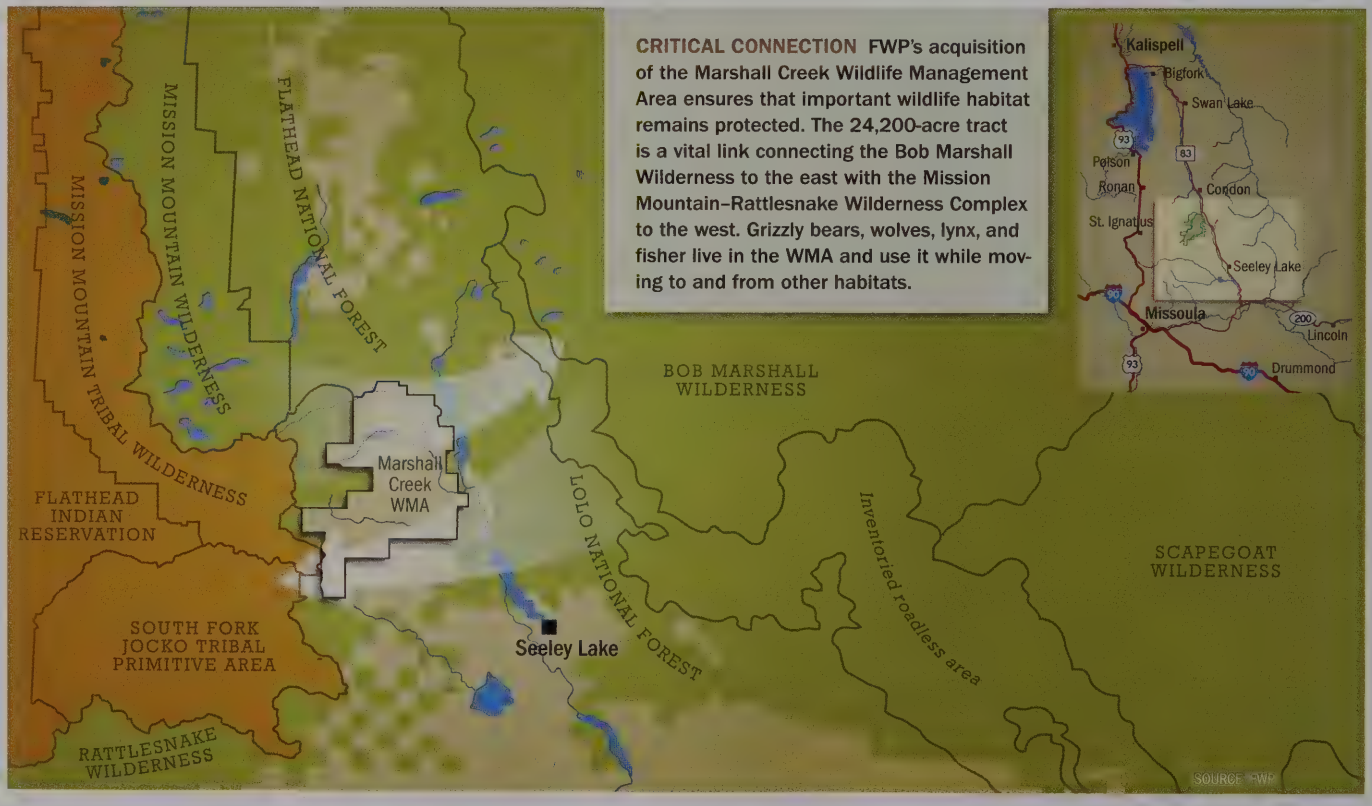
The word *nloloseôsnt*, used by the Salish people who live in this region, translates to "connect it together." That idea sums up the landscape Kolbe and I explored that day: Montana's new Marshall Creek Wildlife Management Area (WMA). Extending from the valley floor to the peaks of the Missions, the newly acquired 40-square-mile parcel features exceptional wildlife habitat and native trout spawning waters. In all, the WMA provides habitat for more than 160 native species, including wolverines and 36 other Montana "species of concern," as well as three species listed as federally threatened: the Canada lynx, grizzly bear, and bull trout.

The parcel connects the Bob Marshall Wilderness to the east and the adjacent Mission Mountain–Rattlesnake Wilderness Complex to the west. "It's a critical piece to the overall landscape connectivity between the Swan Range and Mission Mountains," says Ken McDonald, chief of the FWP Wildlife Bureau. Kolbe, who once spent a decade researching lynx for the U.S. Forest Service, says, "It was also the most important unprotected lynx habitat in the western United States." According to McDonald, the Marshall Creek lands have been among FWP's highest statewide priorities for native fish and wildlife that depend on forested landscapes. "It has pretty much everything we were looking for when it came to making an acquisition of this size and scope," he says.

"A GOOD BALANCE"

Marshall Creek WMA comprises 24,200 acres, with elevations ranging from 4,000 to 6,800 feet. The area is a short drive northwest of Seeley Lake in a perpetually moist forest of spruce, fir, and western larch, with lodgepole pine growing on drier slopes. Though most of the WMA has been logged at one time or another, the area is now thickly forested. Trees grow quickly in the

Todd Tanner of Bigfork is a freelance writer and a senior editor and columnist for Sporting Classics.



CRITICAL CONNECTION **FWP's acquisition of the Marshall Creek Wildlife Management Area ensures that important wildlife habitat remains protected. The 24,200-acre tract is a vital link connecting the Bob Marshall Wilderness to the east with the Mission Mountain–Rattlesnake Wilderness Complex to the west. Grizzly bears, wolves, lynx, and fisher live in the WMA and use it while moving to and from other habitats.**

CLOCKWISE FROM LEFT: LUKE DURAN/*MONTANA OUTDOORS*; TONY BYNUM; ROB CHANEY/*MISSOULIAN*

fertile soil, and a diverse mix of mature and younger stands provides excellent habitat for species like white-tailed and mule deer, moose, elk, snowshoe hares, mountain grouse, great gray owls, mountain lions, wolves, and fisher. Bald eagles, osprey, and loons search for fish in 80-acre Lake Marshall, the largest waterbody on the WMA.

FWP's acquisition of the parcel in 2011 came with strong backing from a wide range of local and state interests, including the Seeley Lake Community Council, Pyramid Mountain Lumber, the Seeley-Swan ATV Club, Montana Trout Unlimited, the Montana Wildlife Federation, and the Rocky Mountain Elk Foundation. Rick Morvilius, president of the Seeley Lake Driftriders Club, says his members were "one hundred percent behind" FWP's acquisition of the Marshall Creek property because the area is a premier site for winter sledding.

One reason for the overwhelming support was FWP's decision to maintain abundant public access on 30-plus miles of logging roads open to vehicles and hundreds more open only to foot traffic. "We have a good balance here between well-maintained open roads and walk-in areas," says Kolbe. "This area also provides public access to tens of thousands of acres of adjacent federal land."

CAT WALK Lynx require snowy, heavily forested landscapes. Before FWP acquired Marshall Creek WMA, says the local wildlife biologist, the area was considered "the most important unprotected lynx habitat in the western United States."

Right: To keep habitat for lynx, elk, and other wildlife secure—and to improve bull trout spawning success in streams—FWP has hired local contractors to close off numerous logging roads lacing the WMA and restore them to a natural state.

Though the Marshall Creek area is no longer in private hands, FWP manages the property in ways that benefit the local economy. Last summer the department contracted with Chris Koppenhaver, owner of an excavation company in Seeley Lake, to close off miles of roads that threatened bull trout spawning streams, pull dozens of culverts, and construct a trailhead complete with horse trailer parking slips. Future plans include more road removal as well as timber management that benefits fish, wildlife, and the local economy. "One reason we lobbied for [the acquisition] is that we knew FWP would maintain that forest in a productive working condition," says Gordy Sanders, resource manager for Pyramid Mountain Lumber.

As with all other WMAs, FWP pays the same property tax to the county as was required of previous owners.

According to Ladd Knotek, FWP area fisheries biologist, some of the most important new management work is aimed at reducing cumulative effects of old logging roads on trout spawning streams. Knotek explains that

the dirt roads bleed sediment and excess nutrients into the creeks. Roads too close to streams deprive the water of shade, causing temperatures to rise above what bull trout require. And small (12- to 36-inch) culverts that function as logging road stream crossings concentrate water flow like a fireman's hose, preventing trout from moving upstream to spawn. "Our goal is to keep the existing open roads while restoring many of the closed ones to a more natural state," says Knotek. That includes replacing dozens of culverts with natural stream crossings that reduce maintenance and allow for fish passage.

LASTING BULL TROUT RECOVERY

The actor Harrison Ford once told a reporter that "the best thing about trout is where they live." That helps explains why the first time I saw Lake Marshall I fell in love. It's a gorgeous mountain lake, the kind that makes you want to climb into a canoe and see if the trout are biting. It also has one of the nicest picnic spots in western Montana. While acknowledging the lake's beauty and hungry resident trout, Knotek says the WMA's most valuable coldwater treasures are 25 miles of clear and icy bull trout spawning and rearing streams: Marshall Creek, Deer Creek, and the West Fork of the Clearwater River.

When FWP removed a fish-blocking dam on the main stem of the Clearwater in 2010, bull trout in that river and the Blackfoot were able to swim upstream for the first time in decades to reach spawning and rearing waters in the Marshall Creek WMA area. "In much of western Montana, we're struggling to hold on to our remnant bull trout populations," says Knotek. "But in the Clearwater drainage we've moved toward lasting recovery and long-term protection."

Though the federally protected bull trout are still off-limits to anglers in the Clearwater drainage, Knotek points out that many native cutthroat trout, which also spawn in the WMA creeks, migrate downstream and grow healthy and large in the Clearwater River, Lake Inez, Lake Alva, and Seeley Lake. "Those migratory cutts augment the resident trout populations and provide a real boost to local fisheries," he says.

BULLS CAN COME HOME Critical to the WMA acquisition was removing a dam (above: before, in hand-held photo, and after) on the Clearwater River that had blocked bull trout from reaching spawning streams in the Marshall Creek drainage.

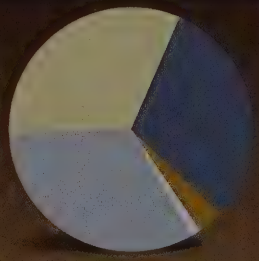
YEAR-ROUND RECREATION

I never would have guessed it, but it turns out the coldest, snowiest weather of the year ushers in Marshall Creek's busiest season. During the peak of winter, more than a hundred snowmobilers each day ride the property's groomed trails and enjoy the area's stunning scenery. The WMA's snowmobile trails form the core of the Seeley Lake trail system, which *SnowWest* magazine ranks among the best in the nation. I was also surprised to learn that the wildlife area can host so many motorized snow sleds without overly stressing wildlife. "During winter, elk and deer move to their winter ranges down in the valley, bears den, and streams are protected by a thick blanket of snow," Kolbe explains. "My research for the Forest Service several years ago confirmed that lynx and other wildlife that remain on Marshall Creek WMA through the winter aren't harmed by recreational snowmobiling."

Much of the WMA's public appeal is its wide range of year-round recreation. In addition to snowmobilers, trappers use it during the snowy months. Anglers, hikers, horse-

Many Hands Make Great Work

Marshall Creek WMA's federally listed or potentially threatened fish and wildlife—including bull trout, Canada lynx, grizzlies, and wolverines—also attracted the attention of federal agencies and The Nature Conservancy (TNC). They recognized the area's enormous ecological value and worked with FWP to protect the critical fish and wildlife habitat. "This project wouldn't have happened without these partners pulling together and working with us to get it done" says Jay Kolbe, FWP wildlife biologist. "We were able to leverage sportsman license dollars with other federal and private conservation funds because we all recognized just how critical this habitat is." FWP bought the 24,200-acre Marshall Creek tract in 2011 from TNC, which had earlier purchased it from Plum Creek Timber Company as part of the conservation organization's Montana Legacy Project. About 70 precent of the roughly $18 million purchase price came from federal grants and programs. FWP paid approximately 30 percent with the hunting license–funded Habitat Montana Program.



The Funding Breakdown:

FWP Habitat Montana Program	$6 million
U.S. Forest Service Forest Legacy Program	$5.9 million
U.S. Fish and Wildlife Service Habitat Conservation Plan Land Acquisition Program	$5.6 million
U.S. Fish and Wildlife Service State Wildlife Grant	$640,000
The Nature Conservancy	$220,000

CLOCKWISE FROM LEFT: ROB CHANEY/*MISSOULIAN*; TODD TANNER; TODD TANNER

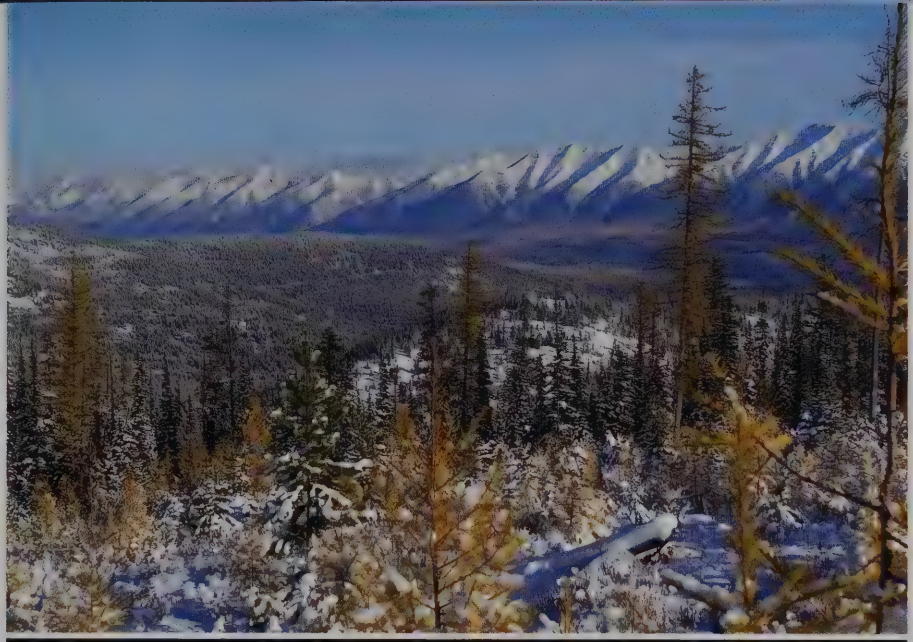
back riders, and wildlife watchers take over in spring and summer. Hunters start showing up around Labor Day for mountain grouse and archery seasons and stay on through the end of big game season. They share the roads in early October with carloads of scenery seekers gawking at great swaths of gold created by the changing needles of larch, known locally as tamarack.

By keeping the property open to the public, FWP ensures that local recreation-based businesses remain viable. "And it's not just local use," adds Kolbe. "This is a destination area for hunters and snowmobilers from across Montana. They come here and bring their wallets with them."

The area's wide range of recreational use is mirrored by its varied landscapes and vegetative communities. In addition to the streams and lake, Marshall Creek WMA contains extensive shallow wetlands, brushy avalanche chutes, open grasslands, and a wide range of forest stands. The streams and wetlands are bordered by dogwood, alder, and willow. Tree species and age vary throughout the forest. All this diversity creates a mixed bag of interconnected habitat types. You might find yourself picking your way through a stand of mature boreal fir or spruce and then, out of nowhere, you step into a ten-year-old cut where larch and alder predominate. Hunters know where to find the specific game species they're after in these forested medleys.

I spent a blissful hour last October wandering through gorgeous, low-elevation aspen groves with one of my golden retrievers. Marshall Creek WMA has abundant ruffed grouse, and, unlike some of the impenetrable thickets I find closer to my home 50 miles away in the Flathead Valley, its coverts are ideal for hunting. Aspen stands provide the birds with plenty of food and protection from avian predators. But they also offer enough open spaces where a hunter can squeeze off a shot before a flushing grouse disappears into the timber.

The big game hunting at Marshall Creek WMA is outstanding. "Some great whitetail bucks and bull elk are taken on this area every year," says Kolbe. "It also winters a good number of moose, and the bear and lion hunting can be fantastic. The views are pretty spectacular, too."

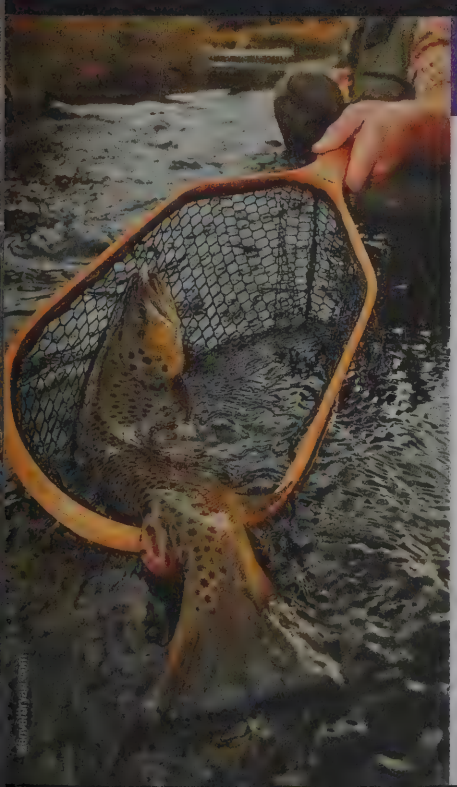


HAPPY ENDINGS The scenic Swan Mountains rise up to the east of the WMA. Dense forests of fir, spruce, pine, and larch provide excellent cover for big game species including elk, mule deer, and white-tailed deer. Below: Taking a day off of work to explore Marshall Creek's diverse hunting opportunities, Jay Kolbe hauls a whitetail buck back to his vehicle.

Which brings us back to that November dawn, a world covered in white, and a landscape too beautiful to believe. Kolbe and I were the only hunters out that morning. We stood on the overlook and marveled at how the light framed the horizon and played across the tops of the clouds, and at how lucky we were to see it all.

But we were there, after all, to hunt, so we climbed back into the truck and drove a mile or two farther up the road and parked. Kolbe, long-legged and fit like the elk he loves to hunt, led me up into the high country, where we spent a few hours glassing distant ridges. We eventually split up, and before long I found a lone bull's track. I never did catch up with that elk, but I tracked him in a foot of new snow, under blue skies and sunshine, through some of the prettiest country I've ever seen. It was an incredible hunt. As for Kolbe—well, he happened to run across a handsome whitetail buck, and where two of us went up the mountain, three of us came down.

ALWAYS READY Montana Coast Guard Auxiliary volunteers Dave Hansen, Helena, and Jim Armstrong, Bozeman, head home after an afternoon on Canyon Ferry Reservoir. They and other auxiliary members check watercraft for safety gear, rescue stranded boaters, help FWP game wardens patrol lakes and rivers, and assist other agencies with wildfire and flood emergency response.



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Under the Radar

The all-volunteer U.S. Coast Guard Auxiliary is the most important water safety force you've never heard of.

BY DAVE CARTY. PHOTOS BY KENTON ROWE

"This gives me a chance to get out and do some volunteer work," says Jon Wells, of a U.S. Coast Guard Auxiliary (CGAUX) "flotilla," or local unit, he is helping establish in Billings. "I'm always looking for some way to do a little bit more."

Wells's attitude is typical of CGAUX volunteers around the state. They are willing to do the unheralded behind-the-scenes work that helps recreational boating in Montana remain as safe as possible.

Wait a second. Did we say *Coast Guard*? ▸▸

Yes, the term does seem odd in a state known more for prairies, wildlife, and mountain ranges than for boating. Yet Montana contains more shoreline in its various reservoirs and rivers—Fort Peck Reservoir alone has more than 1,500 miles—than the entire West Coast. In this mostly arid landscape, 750 miles from the nearest ocean, the Coast Guard's all-volunteer civilian auxiliary is helping save lives and protect aquatic environments.

COAST GUARD–APPROVED Though embedded in a military organization, the Coast Guard Auxiliary's primary mission is recreational boating safety, which it achieves through education and on-the-water patrols. Above: Dave Hansen and Jim Armstrong patrol Canyon Ferry Reservoir in midsummer. Coxswains, who command a vessel, and crew members undergo extensive training and certification in order to represent the U.S. Coast Guard Auxiliary on the water. "Except for combat and direct law enforcement, we are authorized to do anything the rest of the Coast Guard does," says Armstrong, a past auxiliary division commander.

Semper Paratus

Though the CGAUX is not itself a military organization, it is part of the U.S. Coast Guard "family." The organization was founded in 1939 at the onset of World War II, when Congress authorized a Coast Guard "Reserve" to use civilian volunteers to promote safety on oceans and the nation's navigable waters. Two years later, Congress changed the name to Coast Guard Auxiliary. When the United States entered the war, 50,000 auxiliary members joined the effort, guarding waterfronts, carrying out coastal picket patrols, and rescuing shipwreck survivors.

Today the auxiliary operates under the direct authority of the U.S. Department of Homeland Security by way of the Coast Guard. Its 32,000 national members, many of them retired Coast Guard employees, are divided into 16 districts. The 13th District includes Montana, Idaho, Oregon, and Washington. Though embedded in a military organization, the Coast Guard Auxiliary's primary mission is recreational boating safety. It conducts boating education classes, checks boats for safety equipment and invasive species, reports water pollution violations, rescues wayward boaters, and helps game wardens patrol lakes and rivers.

Though they volunteer, auxiliary members are officially federal employees who take their orders from, and issue reports to, the U.S. Coast Guard in Seattle. Their motto, *Semper Paratus*, means "Always Ready."

A warden's right hand

Because both organizations are in the business of water safety, the CGAUX's mission dovetails with that of the Montana Fish, Wildlife & Parks Enforcement Bureau. "They do a ton of important boating education," says Dave Loewen, FWP game warden in Helena. "They generally ask us to come in to their classes and talk about rules and regulations, what you legally can and can't do out on the water."

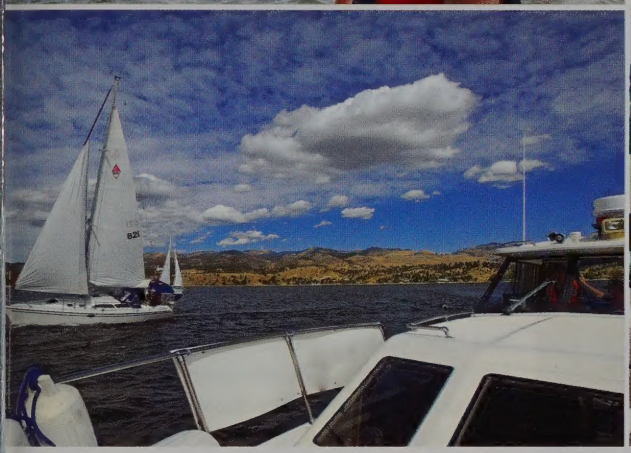
The auxiliary in Montana comprises roughly 65 volunteers who serve in flotillas in Helena, Great Falls, and Kalispell, with detachments in Billings and Missoula. Despite those small numbers, FWP Enforcement officials say the contribution of auxiliary volunteers is enormous. "Their visual presence on the water is a great deterrent," says Ron Jendro, the bureau's Recreational Program manager. "The work they do frees up our wardens to concentrate on other water safety issues."

In addition to boating safety, auxiliary members teach marine radio operation, distribute information and answer questions at boat shows, visit boat dealers to stock safety brochures, and inspect vessels to make sure owners have safety gear such as life jackets, bailers, and fire extinguishers. The volunteers also conduct boat inspections each summer throughout Montana.

"The boating safety work those guys do is essential," says Liz Lodman, who coordinates FWP's Boat Education Program. "They are out there encouraging good watercraft skills and boating safety on rivers and lakes." Lodman notes that 17 fatalities have occurred on Montana waters over the past five years. "We're hoping that they can help us and other agencies bring those tragic numbers way down," she says.

Although auxiliary volunteers see themselves primarily as educators and safety

Dave Carty of Bozeman is a frequent contributor to Montana Outdoors.



KNOT SO EASY Below: Carl "Hutch" Hutchinson of Helena instructs a boater in knot-tying basics at an education session. Below left: Auxiliary patrols inspect a wide range of waterborne vessels, including sailboats and personal watercraft. Left: "We're basically the recreational boating safety arm of the U.S. Coast Guard," says Jim Armstrong, an auxiliary volunteer in Helena.

experts, many are trained to support search-and-rescue operations. They also give cautionary warnings to boaters who appear to be breaking the law. Though auxiliary volunteers have no enforcement responsibility, the navy-blue U.S. Coast Guard uniforms they wear and professional way they conduct themselves lend authority to their presence. "For instance, if we notice someone who appears intoxicated getting into a boat from a dock, we'll suggest to that person that it might not be a good idea to go out," says Dave Hansen, division commander for Montana. "And we'll suggest it again, if necessary, and strongly. But if they jump in that boat and start heading out, we'll call FWP or the sheriff."

Often problems can be resolved simply by providing information. "If we see someone with a boat that's improperly registered, we'll let them know they could get ticketed," Hansen says. "But we also let them know where they can find the necessary information. In some cases, we can give them the forms they need right there so they can fill them out and mail them in."

"We're hoping that the auxiliary can help us and other agencies bring those tragic numbers way down."

Open water can be a dangerous place for recreational boaters and CGAUX volunteers. "That's why we train our people to operate vessels safely," says Hansen. Though auxiliary members are free to use their own boats as they wish, they must be certified when in uniform and representing the auxiliary on the water. "If they're going out on patrol as what we call a 'crew member,' then they have to have certain qualifications, like how to administer first aid, operate the vessel, and tie ropes. After that, we can train them to the next level—'coxswain'—which is someone who is actually in command of the vessel," says Hansen.

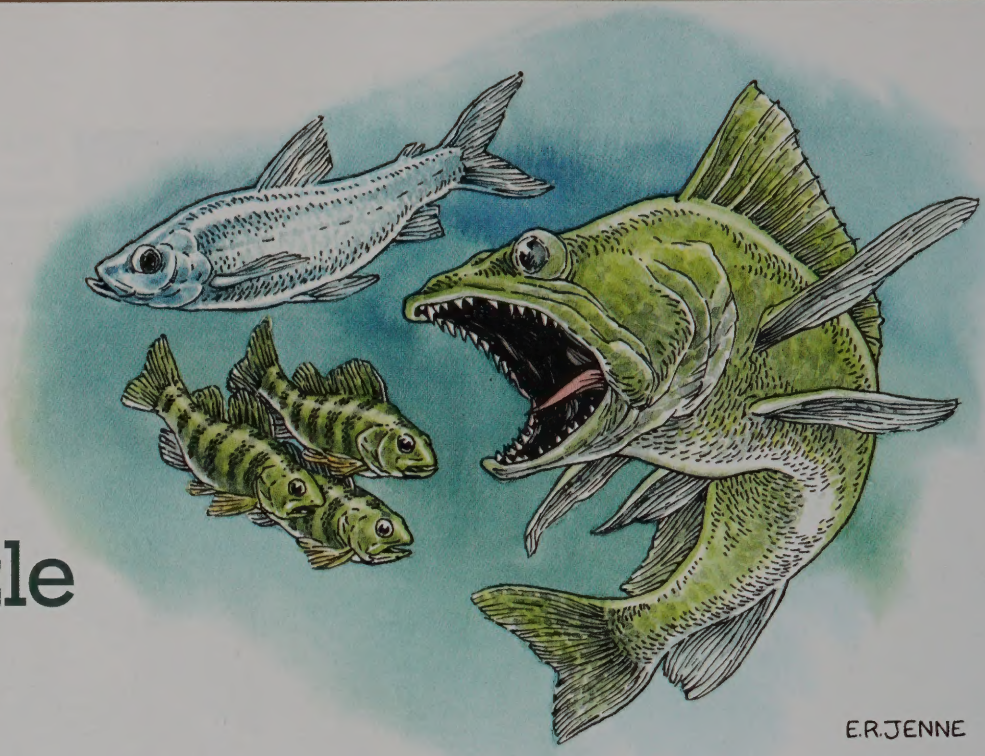
To maintain a high level of competency, the CGAUX conducts field exams in which members are judged on how well they drive a boat, conduct a mock search pattern, handle the craft when towing another vessel, and answer safety and first aid questions.

For all their work and dedication, auxiliary members receive no financial compensation, only the satisfaction of assisting others. For Hansen and his fellow volunteers, that's worth more that a paycheck. "I enjoy helping people," he says, "and I think you'll find that's true of any other auxiliary member you talk to."

The Coast Guard Auxiliary is recruiting volunteers. Learn more at join.cgaux.org/index.php or by calling Dave Hansen, division commander for Montana, at (406) 459-2957.

Solving Tiber's Predator-Prey Puzzle

By Bruce Auchly



When Montana Fish, Wildlife & Parks fisheries workers survey a lake or stream this time of year, they usually look at the outside of the fish they catch. The length, for instance. Or whether a fin has been clipped (indicating a stocked fish).

But sometime they are equally interested in the fish's insides.

That's the case at Tiber Reservoir, an impoundment of the Marias River on the Hi-Line east of Shelby.

Stomach contents of walleye and northern pike are gathered by FWP creel census takers in summer at Tiber fishing access sites and in fall from fish collected in nets by fisheries crews. The partially digested material is preserved in formula. In winter, fisheries workers in laboratories poke through the stomach contents trying to figure out which fish species those predators consumed.

Glamorous work, no. Important, yes.

"The predator-prey issue at Tiber Reservoir is complex," says Dave Yerk, FWP fisheries biologist in Choteau. "We're trying to balance predators and the forage they eat."

Tiber produces some massive predator fish. Northern pike over 30 pounds have been reported. The state record walleye—17.75 pounds—came from Tiber just five years ago.

To ensure that more pike and walleye like those swim in the reservoir, FWP looks closely at what they eat. "As is the case in most western reservoirs, Tiber doesn't have a diverse forage base," Yerk says. "All the pieces of the forage puzzle have to come together to produce trophy-sized fish."

Forage species are the small fish that feed the big fish. With the right amount of forage, or prey species, predator species can grow big. Making that happen is never easy.

For example, in 1984 FWP put spottail shiners, a minnow species, in Tiber for walleye to eat. The good news is that shiners are now tremendously abundant. The bad news is that Tiber's walleye rarely eat them. "Spottails swim near the shore, where walleye are not normally found," Yerk says.

Perch, on the other hand, live in the same areas walleye do. And walleye very much enjoy eating their smaller, striped cousins. "We definitely see improved walleye growth when perch are present," Yerk says.

Perch reproduce on their own in Tiber, especially when high water inundates the vegetated shoreline. Perch spawn best on flooded trees and shrubs. Unfortunately, Tiber's water level fluctuates so much that vegetation has a hard time taking root. Plus, the area is arid and the soil grows few plants.

Nature helps out with wet spring weather and lots of melting snow. Humans help by sinking leftover Christmas trees that perch use for spawning. FWP workers and the Great Falls Chapter of Walleyes Unlimited coordinate this work each winter.

When it all comes together, perch reproduce very successfully. "We saw a huge production spike in spring of 2010 and '11," Yerk says. Those perch are forage that help walleye grow to about 18 inches.

At that length, it's cisco time.

FWP introduced ciscoes into Tiber in the late 1990s. These salmonids eat plankton and grow rapidly, representing a huge food source for predator fish. The problem is that ciscoes can grow too quickly, reaching up to 7 inches long in a year. Not until walleye are 18 to 20 inches long, at about age four, are the predator fish large enough to eat ciscoes.

(Northern pike, on the other hand, are such gluttons they can start eating ciscoes at age two. A lifetime diet of these fatty fish is what produces 20- and 30-pound pike.)

What this means is that perch may be the final piece of the puzzle to unlock Tiber Reservoir's potential as the state's top trophy walleye destination.

It's something to ponder the next time you're there, waiting for a fish to bite.

Bruce Auchly manages the regional Communication and Education Program in Great Falls.

Freshwater sponges

Class Demospongiae

By Lori Micken

People who visit a lake, river, or stream usually pay attention only to the surface. They take pictures, enjoy the sounds and smells of the water, or go fishing. Too often they miss the intriguing environment beneath the surface. Almost all life supported by lakes and rivers is underwater in a world most people never enter. And many of those plants and animals are too small to see with the naked eye.

One summer afternoon while cruising in my rowboat along the shallows of a mountain lake, I peered down into that underwater realm. In the flat, mud bottom I could see roots of pond lily and the carcasses of waterlogged trees. I reached into the clear water to break off a twig covered in a bright green substance that had projections resembling deer antlers in velvet. Rather than slimy, as I'd expected, its texture was rough. It was a freshwater sponge.

SPONGILLA LACUSTRIS FROM WIKIPEDIA

Identification

A sponge is the simplest form of animal life, an abstract skeleton made by and covered with cells. It is a commune constructed of interlacing filaments, a gorgeous filigree of colorless passages, pillars, and grottoes. Most sponges live in the ocean, but a few exist in freshwater.

Alga, a single-celled plant, is what makes the freshwater sponge green. Algae help provide oxygen and food for the sponge. In return, the sponge gives algae a place to live. Situations where two organisms benefit from their interaction are known as symbiotic relationships.

Distribution and size

Approximately 150 species of freshwater sponges are found throughout the United States, usually in clear, shallow waters of ponds, lakes, and slow-moving stream backwaters. Several sponge species exist in Montana, including *Spongilla lacustris* (shown above).

Most freshwaters sponges are a few inches long and form as encrustations on twigs or other hard surfaces.

Structure

For centuries, sponges were considered plants because of their primitive structure and lack of mobility. Their cell layers are not organized into tissues or organs. Various types of microscopic specialized cells—including sclerocytes, flagella, pinacocytes, and myocytes—work together to help the organism survive.

Spicules are the hard, needlelike structures that give sponges their shape. Spicules are composed of silica, a mineral made up of oxygen and silicon.

Ecological function

Sponges serve as food for other aquatic invertebrates, including caddis flies, mayflies, and midges. Because they do not tolerate pollution, their presence indicates clean water.

Reproduction

Sponges contain asexual reproductive cell groups called gemmules, which form when extreme cold, drought, or other conditions threaten a sponge's life. Gemmules resist drying, freezing, and oxygen depletion. Even if a sponge doesn't survive, its gemmules do. When conditions improve, they create another sponge. Another form of asexual reproduction occurs when a piece of sponge breaks off and regenerates into a new organism.

Sexual reproduction also takes place. An egg and sperm form a single cell that grows into a larva, which swims around and eventually attaches to a solid surface such as a twig and develops into an adult sponge.

Lori Micken is a retired high school biology teacher who lives near Livingston.

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PARTING SHOT

PARADISE FOUND Western larch (tamarack) light up a mountainside and lake surface on the new Marshall Creek Wildlife Management Area near Seeley Lake. See page 30 to learn more about this 24,000-plus-acre parcel and the lynx, elk, deer, bull trout, and other wildlife that use and move through it. Photo by Chuck Haney.

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